

THE MOSSES OF THE YARRANGOBILLY CAVES
DISTRICT, N.S.W.

BY DR. V. F. BROTHERUS AND REV. W. WALTER WATTS.

(Communicated by J. H. Maiden.)

FOREWORD.

By the Rev. W. Walter Watts.

Except where otherwise indicated, the Mosses herein recorded were collected by me in January, 1906, during a week's stay at the Yarrangobilly Caves. That week must be reckoned among the most interesting and delightful of my bryological experiences. Many of the species were new to me, and formed a striking link with Tasmanian and European forms. The number of species listed is 110, belonging to 57 genera, and of these ten are new, while several others constitute additions to the flora of New South Wales and even of Australia.

I travelled to the Caves, by way of Tumut, by mail coach (about 50 miles). At the foot of Talbingo Mountain, our party broke the journey, staying the night at Pethers' hotel. The hotel is close to the Tumut River; and the rocks and banks of the river yielded some interesting species, which are listed in a supplemental page. They include a new species, *Rhynchostegiella subconvolutifolia*. On the way up the mountain—a climb of several hours—I collected a few additional species. Including these, 118 species, in all, belonging to 61 genera, were collected.

We stayed for lunch at the Yarrangobilly Village, some 4,200 feet above the sea. Here, on the cliffs and banks of the river, I found a number of species which are included in the general list.

The Caves are nearly 1,000 feet lower down than the Village, the Caves House (herein called the Hostel) being about 3,500 feet above sea-level, and the gorge through which the river runs being a good deal lower still.

To make clear the localities given in the following list:—Two roads lead down to the Caves, one from Yarrangobilly Village, on

the north, the other from Kiandra, on the south. The Hostel stands in a valley between these two roads. Facing it, beyond the gardens, is a fine cliff where many good things were collected. Up the valley is a gully from which water, beautifully clear and cool, is supplied to the house: this I have called the Reservoir Gully. The residence of the Caves guide, Mr. Bradley, stands at the bottom of a short gully that leads northward to the road from the Village: and beyond that road, to the north, is a very fine gully headed by a series of falls. This is the "gully beyond Yarrangobilly Road." In the opposite direction, south of the Hostel, and across the Kiandra Road, is a similar gully leading up to Falls and rocky heights that are of exceptional interest to the bryologist: this is the "gully beyond Kiandra Road." Below the Hostel, towards the river and up the gorge, are the Caves. The "Glory Hole" is the huge entrance to the oldest of these. In the opposite direction, down the river, are the Hot Springs and Baths; and between the Hostel and the Baths, and close round the Springs, in swampy ground, I was rewarded with many treasures. This locality was richest in new species. Yet again, perhaps half-a-mile up the Kiandra Road, is a swamp where some fine things were found, including the rare *Meesea Muelleri*. Higher up, on the main road to Kiandra, is another swamp, where *Pohlia nutans*, *Leptobryum pyriforme*, and other species grow in profusion. Here were collected the only *Sphagna* I secured on the trip, all the specimens being determined by Dr. Warnstorff as *S. subbicolor* Hampe.

The geology of the Caves district is of great interest, not only in itself, but in relation to the characteristic plant life. The following notes, therefore, kindly supplied by Mr. E. C. Andrews, B.A., of the New South Wales Department of Mines, are fittingly included here.

"The Geology of the Yarrangobilly district is varied, embracing the Tertiary leads and basalts, the Devonian conglomerates, claystones, shales and limestones of Lobb's Hole, the magnificent Silurian limestones of Yarrangobilly itself, and the older tuffs and allied rocks of Kiandra. The naturalist may gather fine collections of fossils from the Devonian and Silurian strata; and the

Tertiary 'leads' of Kiandra, underlying the basalts, have yielded fine collections of leaves.

"Briefly, the history of Yarrangobilly appears to have been as follows :—

In Pre-Silurian times a great amount of volcanic ash was piled upon a sinking sea-floor. As time progressed, the adjacent land was elevated, and the waste from this was brought down by torrential streams to form a great conglomerate along the shore-line. As the mountains were reduced by denudation, the conglomerates were overlain by sandstones, and these in turn by mudstones. Long afterwards the sea-water became free from silt, and long lines of coral reefs sprang into existence on the site of the old mudstones. These corals and their associated algæ and mollusc growths then formed belts of limestones in which now occur the Yarrangobilly Caves.

Then came another change. This old sea-deposit sank still lower in part, and in turn received other conglomerates, sandstones and limestones. This was the work of the Devonian period.

A mountain-making period turned the Devonian sea into high dry land, and this has remained above sea-level ever since.

During this period of mountain-making, many reefs of gold and copper were formed, and as the streams wore the mountain-ranges away, the gold-contents of the reefs were in part washed into the watercourses. These rivers at a slightly later period became almost lake-like in width, and many plants became buried in the river-muds and were turned into fossils. The earth now became cracked by great fissures, along and up which molten lava flowed and buried the surrounding country.

A short time since, geologically speaking (end of Tertiary period), the Kiandra and Yarrangobilly district was a great plain near sea-level. It was then lifted up about 4,500 feet. In the process, many parts, failing to hold together, would fall down in terrace-form from the highest block. Thus Kosciusko is the highest step, while Cooma and Yarrangobilly are lower blocks of this uplifted plain, which have fallen away from the highest one.

The streams now became more torrential, and they gradually excavated the magnificent gorges of the Yarrangobilly and Tumut rivers in these faulted blocks. In doing so they brought to light the old buried Silurian limestones, and thus the wondrous caverns of Yarrangobilly were gradually formed by the streams."

These notes by Mr. Andrews will deepen the interest attaching to the flora of the district, and especially of the gorges in the neighbourhood of the Caves, where my collecting was done.

It only remains to sincerely thank Dr. V. F. Brotherus, of Helsingfors, for his kindness in examining the large material I sent him from the Caves, as well as for his many other services to the cause of Australian bryology.

S P H A G N A C E Æ.

1. SPHAGNUM.

S. BICOLOR Hpe. Swamp on Kiandra Road, near southern turn-off to Caves (several numbers).

D I C R A N A C E Æ.

2. CERATODON Brid.

C. PURPUREUS(L.) Brid.

C. PURPUREUS, f. *nervo excedente*. Cliffs opposite Hostel(8511, ster.). A beautiful form with the appearance of a *Blindia*.

3. DISTICHIMUM Br.Eur.

D. CAPILLACEUM(Sw.) Br.Eur. Cliffs opposite Hostel(8530, ster.).

4. DICRANELLA Schimp.

D. sp.(?). Clay edge of watercourse, swamp on main road to Kiandra, about 48 m. from Tumut(8875, ster.).

D. sp.(?). Gully beyond Yarrangobilly Road(8754 ex p., ster.).

5. DICHODONTIUM Schimp.

D. WATTSII Broth., sp.nov. Mixed with *Campyllum subrelaxum* Broth., etc., in "Glory Hole"(8944 ex p., ster.).

Dioicum; gracile, cæspitosum, cæspitibus densis, læte viridibus, opacis; *caulis* erectus, c. 2 cm. longus, inferne rhizoideis

longis, fuscis instructus, densiuscule foliosus, dichotome ramosus vel simplex; *folia* horride patula, e basi breviter vaginante, superne dilatata raptim lanceolato-subulata, obtusiuscula, marginibus erectis, integris, nervo crassiusculo, subcontinuo, cellulis breviter rectangularibus, chlorophyllosis, valde verrucosis, obscuris, basilaribus elongatis, anguste rectangularibus, pellucidis, lævissimis. Cætera ignota.

Species a congeneribus foliorum structura facilliter dignoscenda.

6. DICRANOLOMA Ren.

D. SULLIVANI(C.M.). Reservoir Gully(8697, c.fr.); Gully beyond Yarrangobilly Road(8738, ster.; 8766, ster.; 8772 ex p.).

D. SUBPUNGENS(Hpe.). Gully beyond Yarrangobilly Road(8772 ex p.; with *Bryum pohliaeopsis* C.M.).

7. CAMPYLOPUS Brid.

C. INTROFLEXUS(Hedw.) Mitt. Gully beyond Yarrangobilly Road (8745 ex p., ster.; 8768 ex p.; 8765, ster.).

FISSIDENTACEÆ.

8. FISSIDENS Hedw.

F. LEPTOCLADUS C.M. Cliffs opposite Hostel(8522, ster.); Banks of river below Caves(8911, ster.); Gully beyond Kiandra Road, mixed with *Sauloma tenella*(8835, ster.).

F. LILLIPUTANO-INCURVUS C.M. Loc.?(8935, mixed with *Gymnostomum calcareum*).

F. RIGIDULUS H.f.W. Falls beyond Kiandra Road(8867, ster.); Gully beyond Yarrangobilly Road(8746, ster.).

POTTIACEÆ.

9. GYMNSTOMUM Hedw.

G. CALCAREUM Br.Germ. Cliffs opposite Hostel(8514, ster.; 8517, ster.; 8545, 8552, ster.); entrance to Caves(8921, with *Campylium decussatum*); near Hot Springs(8564, ster.: 8572 ex p., ster.); loc.?(8923, ster.).

10. TORTELLA(C.M.) Limpr.

T. KNIGHTII(Mitt.). Frequent, mostly in clefts of exposed rocks, but only small material, as a rule. Opposite Hostel(8518, c.fr.); track to Hot Springs (several numbers); Rocks below "Glory Hole"(8948 ex p.).

11. TRIQUETRELLA C.M.

TR. PAPILLATA (H.f.W.). Track to Hot Springs(8599, ster.); Reservoir Gully(8705, ster.).

TR. ALBICUSPES Broth. Cliffs opposite Hostel(8509, ster.; 8547 ex p., ster.); Track to Hot Springs(8624, ster.).

12. TRIDONTIUM, Hook. f.

T. TASMANICUM Hook. f. Cliffs and riverbanks, Yarrangobilly Village(8647, 8489, ster.); Reservoir Gully(8657, ster.; 8678, ster.; 8711, c.fr.unic.[with *Bryum blandum*]; 8712, c.fr.supra-mat.); near Hot Springs(8589).

13. BARBULA Hedw.

B. CHLOROTRICHA(Broth. et Geh.) Par. Frequent and in good material, but always sterile. Cliffs opposite Hostel, near top, plentiful; Track to Hot Springs(8622); Swamp by Hot Springs(8648); Reservoir Gully(8703).

B. PSEUDO-PILIFERA Hpe. et C.M. Frequent, often with *B. chlorotricha*. Cliffs opposite Hostel, Reservoir Gully, Gully beyond Yarrangobilly Road, Falls beyond Kiandra Road, Track to Hot Springs, etc. Always sterile.

————— var. SCABRINERVIS Broth. et Watts, var.nov.
Cliffs, bank of river, Yarrangobilly Village(8497, ster.).

B. TORQUATA Tayl. Track to Hot Springs(8599, 8626, 8640 ster.); Reservoir Gully(8662 ex p., ster.); loc. ?(8919).

14. TORTULA Hedw.

T. (SYNTRICHIA) BRUNNEA Broth. et Watts, sp.nov. On rocks off track to Hot Springs(8603, ster., mixed with *Orthotrichum Sullivani*, etc., 8632 and 8635).

Dioica; robustiuscula, caespitosa, caespitibus densissimis, rigidis, brunneis, opacis; *caulis* vix ultra 1·5 cm. longus, erectus,

inferne fusco-radiculosus, densissime foliosus, simplex vel furcatus; *folia* sicca plus minusve distincte spiraliter contorta, humida erecto-patentia, carinato-concava, e basi ovali ligulata, lanceolato-acuminata, obtusiuscula vel acuta, mucronata marginibus anguste recurvis, integerrimis, nervo rufescente, brevissime excedente, dorso lævi, cellulis superioribus rotundato-hexagonis, c. 0.010 mm., dense verrucosis, dein subquadratis, basilaribus internis raptim multo majoribus, rectangularibus, hyalinis, marginalibus in seriebus pluribus minutis, quadratis, infimis anguste rectangularibus, limbum lutescentem efformantibus. Cetera ignota.

Species distinctissima, ab omnibus congeneribus australiensibus foliis mucronatis nec piliferis raptim dignoscenda.

T. PANDURÆFOLIA (Hpe. et C.M.). Track to Hot Springs (8644, c.fr.).

T. PRINCEPS De Not. Frequent on rocks, track to Hot Springs, Falls beyond Kiandra Road, etc.

T. (SYNTRICHIA) SUBBRUNNEA Broth. et Watts, sp.nov. Reservoir Gully (8684, ster., mixed with *Orthotrichum Sullivanii*).

Species *T. brunneæ* habitu simillima, sed foliis muticis, nunquam mucronatis, marginibus erectis cellulisque laminalibus minoribus dignoscenda.

ENCALYPTACEÆ.

15. ENCALYPTA Schreb.

E. TASMANICA Hpe. et C.M. Cliffs opposite Hostel (8533; 8541, c.fr.); near Hot Springs (8566); Reservoir Gully (8654, c.fr.); track to Hot Springs (8568, c.fr.).

GRIMMIACEÆ.

16. GRIMMIA Ehrh.

G. APOCARPA (L.) Hedw. Frequent on rocks.

G. APOCARPA f. SUBMUTICA. Falls beyond Kiandra Road (8538, c.fr., mixed with *Orthotrichum Sullivanii*: 8806, c.fr.); Reservoir Gully (8659, c.fr.).

G. MUTICA Hpe. Falls beyond Kiandra Road (8808, c.fr.).

G. CAMPESTRIS Burch. (*G. leucophaea* Grev., *G. leiocarpa* Tayl.).
Gully beyond Yarrangobilly Road(8765 ex p.).

G. PULVINATA (L.) Sm., var. OBTUSA (Brid.) Br. Eur. (*G. cygnicollis* Tayl.). Near Hot Springs(8758, c.fr.); Gully beyond Yarrangobilly Road(8747); Cliffs opposite Hostel(8513, c.fr.).

17. RHACOMITRIUM Brid.

R. PSEUDO-PATENS (C.M.) Par. Cliffs opposite Hostel(8536, ster.); Reservoir Gully(8658, c.fr.; 8660; 8664, c.fr.: 8672, c.fr.; 8681, c.fr.; 8687, ster.; 8691, ster.; 8698).

ORTHOTRICHACEÆ.

18. ZYGODON Hook. et Tayl.

Z. BROWNII Schwgr. Cliffs opposite Hostel(8554, ster.; 8538, ster.); Gully and Falls beyond Kiandra Road(8856 ex p., c.fr.; 8537, ster.; 8803, c.fr., ex p.; 8839, c.fr.: 8866, c.fr.); Track to Hot Springs(8607, ster.; 8572 ex p., ster.); Reservoir Gully(8670, c.fr.); loc. ?(8922, ster.).

Z. HOOKERI Hpe. Gully beyond Kiandra Road(8802 ex p., ster.).

Z. INTERMEDIUS Br. Eur. Some fine specimens. Track to Hot Springs(8560, ster.; 8567, ster.; 8576, ster.); Cliffs opposite Hostel(8512, ster.); Reservoir Gully(8524); Gully beyond Kiandra Road(8530, c.fr.): loc. ?(8649, ster.).

19. ORTHOTRICHUM Hedw.

O. ACROBLEPHARIS C.M. Cliffs, bank of River, Yarrangobilly Village(8503, c.fr.); Yarrangobilly River below Caves(8901, c.fr., mixed with *O. laterale*).

O. LATERALE Hpe. Gully beyond Yarrangobilly Road(8763, c.fr.; 8768, c.fr.); Yarrangobilly River below Caves(8901, c.fr., with *O. acroblepharis*).

O. SULLIVANI C.M. Frequent in good quantity and fine fruit. Falls beyond Kiandra Road(8827, 8800, 8864, 8941); rocks below "Glory Hole"(8949, with *G. apocarpa*); near Hot Springs(8557, 8618); Cliffs, river bank, Yarrangobilly Village(8493, 8484); also collected by W. Forsyth, in 1901, "Yarrangobilly Caves."

FUNARIACEÆ.

20. FUNARIA Schreb.

- F. (ENTOSTHODON) sp. In bed of Yarrangobilly River below Caves(8910, c.fr.).
 F. HYGROMETRICA(L). Here and there, mixed with other mosses.
 F. TASMANICA Hpe. et C.M. Track to Hot Springs(8569, c.fr.; 8617, c.fr.).

BRYACEÆ.

21. MIELICHHOFERIA Hsch.

- M. AUSTRALIS Hpe. Cliffs, river bank, Yarrangobilly Village (8482, c.fr.; 8483, c.fr.).

22. LEPTOBRYUM(Br.Eur.) Wils.

- L. PYRIFORME(L.) Wils. Entrance to Castle Cave(8946 ex p., ster.; 8933, ster.); Gully near Bradley's house(8733, c.fr.; 8734, ster.); Swamp, main road to Kiandra, about 48 m. from Tumut(8880 ex p., c.fr.); Gully beyond Yarrangobilly Road(8732 ex p., ster.).

23. POHLIA Hedw.

- P. CRUDA(L.) Lindb. Entrance to Caves(8942, ster., mixed with *Campylium subrelaxum* Broth.).
 P. NUTANS(Schreb.) Lindb. Roadside near Yarrangobilly Village (8486, c.fr.); Swamp on main road to Kiandra, about 48 m. from Tumut(8889, c.fr.; 8880 ex p., c.fr.).

24. MNIQBRYUM(Schimp. ex p.) Limpr.

- M. TASMANICUM Broth. By Yarrangobilly River below Caves (8903, ster.); Gully above Bradley's house(8729, ster.; 8733 ex p., ster.); Yarrangobilly Village(8502, mixed with *Bartramia papillata*); Gully beyond Yarrangobilly Road(8791 ex p., ster.; 8776, ster.); Glory Hole(8944a).

25. BRYUM Dill.

- B. ABRUPTINERVIVM C.M. Falls beyond Kiandra Road(8853, ster.; 8861, c.fr.); Reservoir Gully(8706, c.fr.).
 B. ALTISETUM C.M. Track to Hot Springs(8565, c.fr.; 8575, c.fr.); Cliffs opposite Hostel(8544; 8511, c.fr.).



- B. BIMUM Schreb. Swamp, Kiandra Road(8886, c.fr.; 8888, c.fr.: 8892, c.fr.; 8894, c.fr.: 8895, c.fr.); near Caves(8929, c.fr., leg. Bradley jun.); Cliffs opposite Hostel(8504, c.fr.).
- B. BLANDUM H.f.W. Reservoir Gully(8690, 8711a, ster., 8712 ex p.); Cliffs, riverbank, Yarrangobilly Village(8495, ster.); Falls beyond Kiandra Road(8939). Also collected by W. Forsyth, December, 1901, and det. as *B. oblongifolium* (H.f.W.).
- B. CÆSPITICIUM L. Track to Hot Springs(8625, c.fr.).
- B. LEVIGATUM H.f.W. Reservoir Gully(8712 ex p., ster.).
- B. POHLLEOPSIS C.M. Gully beyond Yarrangobilly Road(8744, c.fr.; 8772, c.fr., with *Dicranoloma Sullivani*); Cliffs opposite Hostel(8506, c.fr.; 8516, c.fr.; 8520, c.fr.); Track to Hot Springs(8602, c.fr.; 8605, c.fr.); Reservoir Gully(8653, c.fr.: 8666, c.fr.).
- B. PYROTHECIUM Hpe. et C.M. Track to Hot Springs(8650, c.fr.); Gully beyond Yarrangobilly Road(8752, c.fr., mixed with *L. pyriforme*).
- B. SULLIVANI C.M. Swamp near Hot Springs(8637, ster.); Falls beyond Kiandra Road(8794, ster.).
- B. VENTRICOSUM Dicks. Swamp near Hot Springs(8585, c.fr.).
- NOTE.—*B. austro-affine* Broth., sp.nov., leg. W. Forsyth, Dec., 1901, at Kiandra(No.1010) is recorded also for Yarrangobilly Caves(Nos.1012 and 1014), but I regard the record as doubtful (W.W.W.).

RHIZOGONIACEÆ.

26. RHIZOGONIUM Brid.

- R. MNIODES(Hook.) Schimp. Falls beyond Yarrangobilly Road (8754, ster., mixed with *Dicranella* sp.(?); 8761, ster.; 8793, c.fr. supramat.); Cliffs, river bank, Yarrangobilly Village (8490, ster.).

AULACOMNIACEÆ.

27. LEPTOTHECA Schwgr.

- L. GAUDICHAUDII(Spreng.) Schwgr. Gully beyond Yarrangobilly Road(8739, ster.; 8785, ster.).

M E E S E A C E Æ.

28. MEESEA Hedw.

M. MUELLERI C.M. et Hpe. Swamp, road from Yarrangobilly Caves to Kiandra(8891, c.fr.).

B A R T R A M I A C E Æ.

29. BARTRAMIA Hedw.

B. ERECTA(Hpe.) Broth.(*Bartramidula Hampei* Mitt.). "Yarrangobilly Caves": leg. W. Forsyth, Dec. 1901.

B. MOSSMANNIANA C.M. Reservoir Gully(8693, c.fr.; 8665; 8675, c.fr.); Gully and Falls beyond Kiandra Road(8822, ster.).

B. PAPILLATA H.f.W. Common on rocks in all the gullies; also at the Village on cliffs; Swamp, road from Caves to Kiandra (8893).

30. PHILONOTIS Brid.

PH. (EUPHILONOTIS) AUSTRO-FALCATA Broth. et Watts, sp.nov. Frequent. Reservoir Gully(8702); Gully beyond Kiandra Road(8854, forma); near Hot Springs; Cliffs, Yarrangobilly Village.

Dioica; gracilescens, cæspitosa, cæspitibus densis lutescenti-vel fusciscenti-viridibus, fusco-tomentosis, opacis; *caulis* usque ad 3 cm. altus, erectus, dense foliosus, simplex; *folia* sicca adpressa, superiora interdum indistincte homomalla, humida erecto-patentia, valde carinato-concava, lanceolata, marginibus anguste revolutis, geminatim serrulatis, nervo crassiusculo, plerumque cum apice evanido, rarius brevissime excedente, dorso superne serrulato, cellulis laxiuscule hexagono-oblongis, superioribus apice mamillöse exstante. Cætera ignota.

Species *Ph. falcate*(Hook.) Mitt., affinis, sed folii cellulis superioribus laxioribus, minutius mamillosis dignoscenda.

PH. sp., Broth. et Watts, sp.nov. (Specimen lost).

PH. DICRANELLACEA C.M. Reservoir Gully(8680); Springs(8577); Gully across Kiandra Road(8804, 8842); Gully across Yarrangobilly Road(8783, 8790); Village(8494); Talbingo Cutting (8480).

PH. (EUPHILONOTIS) FONTANOIDES Broth. et Watts, sp.nov.

Swamp, Kiandra Road, about 48 m. from Tumut (8873, 8879).

Dioica; robustiuscula, caespitosa, caespitibus densis, lutescentibus, fusco-tomentosis, opacis: *caulis* erectus, usque ad 5 cm. longus, dense foliosus, apice verticillatim ramosus, ramis usque ad 1.5 cm. longis, vel simplex: *folia* sicca adpressa, humida suberecta, carinato-concava, ovato-lanceolata, longe aristata, marginibus erectis vel angustissime revolutis, simpliciter et minute serrulatis, nervo crassiusculo, in aristam elongatam, rigidam, serrulatam excedente, dorso sublævi, cellulis superioribus flexuoso-linearibus, basi mamillöse exstante basilaribus oblongis, sublævibus. Sporogonia ignota.

Planta mascula femineæ similis, perigonii terminalibus, disciformibus; bracteæ perigonii patentes, e basi late ovata lanceolato-subulatæ, aristatæ, minutissime serrulatæ, cellulis linearibus, lævibus.

Species a *Ph. austro-falcata* statura robustiore foliorumque structura optime diversa, habitu *Ph. fontaneæ* similis.

PH. SCABRIFOLIA (H.f.W.), (*Ph. remotifolia* H.f.W.). Reservoir Gully (8663, ster.).

PH. TENUIS Tayl. Swamp, Kiandra Road (8871, 8874 var. ?)

PH. sp.(?). Gully beyond Yarrangobilly Road (8778).

PH. sp.(?). Kiandra Road (8817).

PH. sp.(?). Reservoir Gully (8668).

31. BREUTELIA Schimp.

B. AFFINIS (Hook.) Mitt. Reservoir Gully (8699, ex p.); Track to Hot Springs (8645, 8601); Gully beyond Yarrangobilly Road (8789 ex p.); Falls beyond Kiandra Road (8849): all ster. Also collected by W. Forsyth, Dec., 1901.

B. COMMUTATA (Ipe.) Par. Falls beyond Kiandra Road (8869, ster.); Reservoir Gully (8655; 8665 ex p., c.fr.; 8679, c.fr.; 8671, ster.); Gully beyond Yarrangobilly Road (8770, 8779); near swamp by Hot Springs (8612, ster.): Cliffs opposite Hostel (8526, 8533, 8542).

- B. PENDULA(Hook.) Jæg. Swamp, road from Caves to Kiandra (8876-8, fine fruiting specimens); 8881, ster.; 8883, c.fr.); Gully beyond Yarrangobilly Road (ster., mixed with *Rhizogonium unioides*; 8760, ster.).

POLYTRICHACEÆ.

32. POLYTRICHUM Dill.

- P. COMMUNE L. Swamp, road from Caves to Kiandra(8900).
P. JUNIPERINUM Willd. Reservoir Gully(8710).

HEDWIGIACEÆ.

33. HEDWIGIA Ehrh.

- H. ALBICANS(Web.)Lindb. Falls beyond Kiandra Road(8845, c.fr.); Reservoir Gully(8692, c.fr.); and a few scraps elsewhere.

34. HEDWIGIDIUM Br. Eur.

- H. IMBERBE B. & S. Gully beyond Yarrangobilly Road (8751, ster.).

NECKERACEÆ.

35. LEPTODON Mohr.

- L. SMITHII(Dicks.)Mohr. Cliffs opposite Hostel(8505, ster.); Yarrangobilly River, below Caves(8915, ster.).

LEMBOPHYLLACEÆ.

36. CAMPTOCHETE Reichdt.

- C. GRACILIS(H.f.W.)Par. Gully beyond Yarrangobilly Road (8740, ster.); 8742, ster.).

37. LEMBOPHYLLUM Lindb.

- L. DIVULSUM(H.f.W.) Lindb. Frequent. By river(8907, 8913, 8917); Gully beyond Yarrangobilly Road (8743, 8767 ex p., 8787 ex. p.); Gully beyond Kiandra Road (8821); Reservoir Gully(8674, 8689, 8708); Track to Hot Springs (8597, 8606); Castle Cave(9831). All sterile.

FABRONIACEÆ.

38. FABRONIA Radd.

F. AUSTRALIS Hpe. Cliff, Yarrangobilly Village(8492 ex p.).

HOOKERIACEÆ.

39. PTERYGOPHYLLUM Brid.

P. NIGELLUM(H.f.W.). Falls beyond Kiandra Road(8796, ster.); Falls beyond Yarrangobilly Road(8782, ster.; 8781, ster.).

40. SAULOMA(H.f.W.)Mitt.

S. TENELLA(H.f.W.)Mitt. Gully beyond Kiandra Road, in earth-bank(8735, 8843, 8852, good fruiting specimens).

HYPOPTERYGIACEÆ.

41. HYPOPTERYGIUM Brid.

H. MUELLERI Hpe et C.M. "Glory Hole"(8945, ster.).

RHACOPILACEÆ.

42. RHACOPILUM Palis.

R. CONVOLUTACEUM Hpe. Gully beyond Kiandra Road(8857, ster.); and a few scraps in other packets from other places.

LESKEACEÆ.

43. PSEUDOLESKEA Br. Eur.

P. CALOCHLORA(C.M.). Track to Hot Springs(8566, ster.; 8638).

44. THUIDIUM Br. Eur.

TH. FURFUROSUM(H.f.W.)Jæg. Gully beyond Kiandra Road (8863, ster.); Reservoir Gully(8705 ex p., 8701 ex p.); near Hot Springs(8571, ster.).

TH. HASTATUM C.M. Frequent. Cliffs opposite Hostel(8525, 8527, 8535); Reservoir Gully(8720 ex p.); Gully beyond Kiandra Road(8841, 8848, 8860); Gully beyond Yar-

rangobilly Road(8741, 8753, 8774, 8784); Track to Hot Springs(8604, 8647): near Hot Springs(8594, 8610): loc. (?) (8619, 8927).

TH. SUBERECTUM(Hpe.)Jæg. Gully beyond Yarrangobilly Road(8777 ex p., 8764 ex p.): Hot Springs (8590 ex p., 8591 ex p., 8596).

TH. UNGUICULATUM H.f.W. Gully beyond Kiandra Road(8846. mixed with *Philonotis aus-ro-falcata*, sp.nov.).

HYPNACEÆ.

45. AMBLYSTEGIUM Br. Eur.

A. (EUAMBLYSTEGIUM) NOVE-VALESIAE Broth. et Watts, sp. nov.

Autoicum; tenellum, caespitosum caespitibus densis, læte viridibus, opacis; *caulis* elongatus, repens, dense pinnatim ramosus, ramis vix ultra 5mm. longis, adscendentibus vel erectis, terebibus, dense foliosis, simplicibus, obtusis; *folia* e basi erectiore squarruloso-patulis, concaviuscula, e basi ovata lanceolato-subulata, marginibus erectis, ubique minute denticulatis, nervo latiusculo, ad medium folii evanido, cellulis ovali-hexagonis (2-3:1), pellucidis, lævissimis. Cætera ignota.

Species tenella, habitu *A. serpenti*(L.) Bryol. eur. sat similis.

46. SCIAROMIUM Mitt.

S. (ALOMA) ELIMBATUM Broth. et Watts, sp. nov. Falls beyond Kiandra Road(8540, ster.).

Gracile, caespitosum, caespitibus densiusculis, depressis, rigidis, læte viridibus, ætate lutescentibus; *caulis* elongatus, repens, parce radiculosus, dense foliosus, irregulariter pinnatim ramosus, ramis adscendentibus vel suberectis, 5-10 mm. longis, dense foliosis, simplicibus vel subsimplicibus, obtusis; *folia* patentia, plerumque homomalla, ovata, breviter acuminata, plus minusve obtusa, marginibus erectis, subintegris, haud limbata, nervo crasso, viridi, infra summum apicem folii evanido, cellulis oblongo-hexagonis, basilaribus majoribus, alaribus sat numerosis, subquadratis, chlorophyllosis, omnibus lævissimis. Cætera ignota.

Species foliis elimbatis a congeneribus australiensibus ad huc cognitis longe diversa, cum *S. flavidulo* Dus. e Fuegia comparanda.

S. (ALOMA) FORSYTHII Broth., sp. nov.

On rocks at Falls, Yarrangobilly: leg. W. Forsyth, Dec. 1901(No. 1148, Syd. Herb., ster.).

Robustiusculum, cæspitosum, rigidum, sordide viride; *caulis* elongatus, fluitans, inferne subsimplex foliisque destructis, dein dense pinnatim ramosus, ramis patentibus, dense foliosis, obtusis, infimis 2 cm. vel paulum ultra longis, subsimplicibus, superioribus sensim brevioribus, simplicibus: *folia* sicca laxè adpressa, humida erecto-patentia, ovata, breviter acuminata, obtusa, marginibus erectis, integris, haud limbata, nervo crasso, infra summum apicem folii evanido, cellulis oblongo-hexagonis, basilaribus majoribus, alaribus vix distinctis, omnibus lævissimis. Cætera ignota.

Species a præcedente statura multo robustiore et ramificatione oculo nudo jam dignoscenda.

47. DREPANOCLADUS(C.M.)Roth.

D. BRACHIATUS(Mitt.). Swamp near Hot Springs(8578, 8581 ex p., 8582).

D. FLUITANS(Dill.)var.FALCATUS Sch. Reservoir Gully(8714, c.fr.).

D. (WARNSTORFIA) STRICTIFOLIUS Broth. et Watts, sp. nov. Swamp near Hot Springs(8581 ex p., 8586, 8588). Sterile.

Robustiusculum, cæspitosum, cæspitibus densis, lutescenti-viridibus, inferne fusciscentibus, nitidis; *caulis* elongatus, dense foliosus, plus minusve dense pinnatim ramosus, ramis patulis, vix ultra 1 cm. longis, dense foliosis, obtusis; *folia* horride patula, haud decurrentia, caulina ovato-lanceolata, breviter subulata, marginibus erectis, integris, nervo sat tenui, ultra medium folii evanido, cellulis anguste linearibus, alaribus laxis, in ventrem excavatum dispositis, ramea minora, nervo tenuiore. Cætera ignota.

Species foliis strictis, horride patulis faciliter dignoscenda, habitu *Campylio stellato* sat similis.

48. ACROCLADIUM Mitt.

- A. CHLAMYDOPHYLLUM (H.f.W.) Broth. Swamp near Hot Springs(8580, c.fr.); Cliffs opposite Hostel(8528, c.fr.); Reservoir Gully(8694, c.fr.; 8716 ex p., ster.).

49. CAMPYLIUM(Sull.)Bryhn.

- C. DECUSSATUM(H.f.W.). Reservoir Gully(8661, 8717, 8724, 8727); Hot Springs (8591b); "Glory Hole"(8943, 8947 a-b); loc.(?)(8926); Swamp, Kiandra Road(8887). All sterile.
- C. RELAXUM (H.f.W.). Falls beyond Kiandra Road(8801, 8815, 8820); Falls beyond Yarrangobilly Road(8737, 8757-9, 8749, 8791); by river below Caves(8908); Reservoir Gully(8682); near Bradley's house(8731); Swamp, Kiandra Road(8896).
- C. SUBRELAXUM Broth. In Cave(8947, 8591 ex p.). Also collected by W. Forsyth, Dec. 1901.

50. ECTROPOTHECIUM Mitt.

- E. (CUPRESSINA) CONDENSATUM Broth. et Watts, sp. nov.
Near Hot Springs(8593).

Gracile caespitosum, caespitibus densis, mollibus, laete viridibus, aetate lutescentibus, nitidis; *caulis* elongatus, repens, ramosus, ramis procumbentibus, dense foliosis, dense et regulariter pinnatim ramulosis, ramulis patentibus, vix ultra 1 cm. longis, dense foliosis, simplicibus, obtusis; *folia* falcata, ovato-lanceolata, longe subulata, marginibus erectis, integris vel minutissime serrulatis, enervia vel brevissime binervia, cellulis anguste linearibus, alaribus paucis, laxis, hyalinis, omnibus laevissimis. Caetera ignota.

51. STREODON(Brid.) Mitt.

- S. CUPRESSIFORMIS(L.) Brid. Plentiful, especially in gully beyond Kiandra Road, where found in good fruit(8795).
- S. MOSSMANNIANUS(C.M.). Gully and Falls beyond Kiandra Road (8832, c.fr.; 8816 ex p.; 8836 ex p.; 8847, c.fr.; 8868); Gully

beyond Yarrangobilly Road(8755, ster.; 8771, ster.). Also collected by W. Forsyth, Dec. 1901(1139, Hb. Syd.).

S. WALTERIANUS(Hpe.) Falls beyond Kiandra Road(8859), on bark of tree mixed with *Rhaphidostegium callidioides*).

52. ACANTHOCLADIUM Mitt.

A. EXTENUATUM(Brid.) Mitt.

53. ISOPTERYGIUM Mitt.

I. AMBLYOCARPUM(Hpe.). Falls beyond Kiandra Road(8807, ster.).

SEMATOPHYLLACEÆ.

54. RHAPHIDOSTEGIUM(Br.Eur.) De Not.

R. CALLIDIoidES(C.M.) Jæg. Reservoir Gully(8700); Swamp near Hot Springs(8633, c.fr., mixed with *Brachythecium paradoxum*, c.fr.; 8613, c.fr., with *Rhynchostegium tenuifolium*; 8623, c.fr.); Track to Hot Springs(8643); Gully beyond Kiandra Road(8814, ster.).

BRACHYTHECIACEÆ.

55. BRACHYTHECIUM Br.Eur.

B. PARADOXUM(H.f.W.) Jæg. Frequent. Cliffs opposite Hostel, gullies beyond Kiandra Road and Yarrangobilly Road, Reservoir Gully, and near Hot Springs. Occasionally in fruit, and sometimes mixed with *Rhaphidostegium callidioides*.

B. PLUMOSUM(Sw.). (*B. pseudo-plumosum* Brid.). Gully beyond Yarrangobilly Road(8748); Reservoir Gully(8718, ster.) f. *robusta*. Also at Yarrangobilly Village.

B. RUTABULUM(L.) Br.Eur. Fairly frequent in the gullies and swamps, and on the cliffs opposite Hostel, but always sterile.

B. SALEBROSUM(Hoffm.) Br.Eur. Reservoir Gully(8723, c.fr. sparse); Hot Springs(8595, ster.).

56. OXYRHYNCHIUM(Br.Eur.) Warnst.

O. AUSTRINUM(H.f.W.) Broth. Reservoir Gully(8695, ster.; 8669, ster.; 8719, ster.; 8726, ster.).

57. RHYNCHOSTEGIUM Br. Eur.

- R. COLLATUM(H.f.W.). Falls beyond Kiandra Road(8824, ster.); by river below Caves(8905, ster.); near Hot Springs(8630, ster.).
- R. TENUIFOLIUM(Hedw.) Jæg. Swamp near Hot Springs(8636, c.fr.; 8613 ex p.; 8645 ex p.); Gully beyond Yarrangobilly Road(8769, ster.).

SUPPLEMENT.

Species collected in, and by, the bed of the Tumut River, close to the Halfway House (Pethers' Hotel) at the foot of Talbingo Mountain, on the way up to Yarrangobilly, January, 1906 :—

- Pleuridium gracilentum* Mitt.
Leucoloma Sieberi Hsch.
Campylopus introflexus Hedw.
Barbula pseudo-pilifera.
Funaria aristata Broth.
Grimmia apocarpa(L.) and f. *submutica*.
Racomitrium symphyodon Mitt.
Orthotrichum laterale Hpe.
O. acrolepharis C.M.
Breutelia affinis Hook
B. pendula Hook.
Hedwigia albicans.
Hedwigidium imberbe.
Pseudoleskea calochlora(C.M.).
Thuidium furfurosum.
Rhacopilum convolutaceum.
Rhynchostegiella subconvolutifolia Broth. et Watts, sp.nov.
 On flood-washed bushes in bed of river(8443, c.fr.),
 Species *Rh. convolutifolia*(Hamp.) Broth., valde affinis, sed statura duplo majore foliisque concavis, multo latioribus, obtusis, subintegris dignoscenda.
Brachythecium plumosum(Sw.).
B. rivulare Br.Eur.
B. rutabulum.

The following species were collected in the cutting on the way up Talbingo Mountain : —

- Ditrichum affine* C.M.
Philonotis dicranellacea C.M.
Mielichhoferia australis Hpe.
Bryum Sullivanii C.M.
Philonotis scabrifolia (H.f.W.).
Breutelia commutata Hpe.

POSTSCRIPT [*added 19th November, 1912*].—Since this paper was read, the following additions have been made to the list :—

ORTHOTRICHACEÆ.

AMPHIDIUM CYATHICARPUM (Mont.). Falls across Kiandra Road.

BARTRAMIACEÆ.

BREUTELIA DIVARICARTA Mitt. Cliffs opposite Hostel.

NECKERACEÆ.

CAMPTOCHAETE DEFLEXA (H.f.W.), forma. River-bank below Caves (8906).

[The numerals in this paper refer to the Collectors' numbered packets; c.fr., and ster., to fruiting or non-fruiting specimens respectively.]